

Unit 4.5  
Counting Principles  
Day 2  
Permutations

Using the Fundamental Counting Principle.

1) How many ways can you arrange the letters in the word GROUP?

$$5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

2) How many ways can you arrange 3 letters of the word GROUP?

$$5 \cdot 4 \cdot 3 = 60$$

If  $P(n, r)$  denotes the number of permutations of  $n$  elements taken  $r$  at a time, with  $r \leq n$ , then

$$P(n, r) = \frac{n!}{(n-r)!}$$



$n P_r$

Permutation: is the arrangement of some or all of the elements of a Set in a particular order. Each order is considered a different arrangement

Using the Permutation Formula.

- 3) How many ways can you arrange the letters in the word GROUP?

$$P(5,5) = \frac{5!}{(5-5)!} = \frac{5!}{0!} = 120$$

- 4) How many ways can you arrange 4 letters of the word GROUP?

$${}_5P_4 = \frac{5!}{(5-4)!} = \frac{5!}{1!} = 120$$

5) A museum has 7 paintings to hang and only 3 vacant locations, each of which will hold a painting. In how many different ways can the three locations be filled by the paintings?

$${}^7P_3 = \frac{7!}{(4)!} = 7 \cdot 6 \cdot 5 = 210 \text{ ways}$$

6) How many different ways can 8 people be seated in a row of 5 chairs?

$${}^8P_5 = \frac{8!}{3!} = 6720 \text{ ways.}$$

7) All we know about Shannon, Patrick and Ryan is that they have different birthdays. If we listed all the possible ways for this to happen, how many would there be? Assume that there are 365 days in a year.

Permutation

$${}^{365}P_3 = \frac{365!}{362!} = 48,228,180 \text{ ways}$$

C.P.

$$365 \cdot 364 \cdot 363$$

8) How many different 4-letter codes can be formed using the letters A, B, C, D, E, and F? No letters may be repeated.

$${}_6P_4 = \frac{6!}{2!} = 360$$

$$\frac{6!}{3!} = 654$$

How many ways can 6 volleyball players be assigned to 6 positions, assuming that any player can play any position?

$${}_6P_6 = \frac{6!}{0!} = \frac{720}{1} = 720$$

In how many ways can 11 players be assigned to the six positions on the court (again, assuming that all players can play each position)?

$${}_{11}P_6 = \frac{11!}{5!} = 332,640$$

Hmk: Unit 4.5 Day 2